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ABSTRACT

A protocol study investigated whether computer tutors (programs that interactively guide writers while they freewrite with a word processing program) promote or hinder a richer understanding of the composing process. The analysis focused on writers' attitudes toward computer tutors in the invention process. Data were collected by tape recording a single college freshman as she acquainted herself with word processing and computer tutors. The student was asked to verbalize everything she was thinking, whether or not she thought it was relevant. This resulted in a record of the entire writing process, from generating ideas to processing lower-order concerns, such as spelling and proper keystrokes. Analysis of the protocols revealed that she seemed to be engaged by the interactive invention program but never indicated that she thought the computer was intelligent or possessed of human qualities. Although the subject was aware of the on-line help feature, she never took advantage of it, seeming content to use the word processing program as a glorified typewriter and missing out on the chance to revise and edit using features such as cut-and-paste or search-and-replace. Her reluctance to use these special programs represents general student attitudes, indicating students still are not convinced their writing could benefit from these computer tutors. (A list of 11 references is included, and transcripts of the protocols are appended.) (AEW)

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EVALUATING COMPUTER-TUTORS: A PROTOCOL STUDY

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EVALUATING COMPUTER-TUTORS: A PROTOCOL STUDY

ABSTRACT

In this paper, I discuss the results of a protocol study conducted to investigate whether computer-tutors, programs that interactively guide a writer while she freewrites with a word processing program and generates ideas with an invention program, promote or hinder a richer understanding of the composing process. Specifically this protocol analysis focuses on the writer's attitude toward computer-tutors in the invention process and changes not predicted by inconclusive earlier studies of computer-assisted heuristic strategies.

BACKGROUND

Viewing the process. Several years ago I began looking at rhetorical invention on the computer, with a sense that the computer would cause powerful changes in writers. My empirical study looked at heuristic exercises done previous to a final draft, comparing pre and post samples; it looked at products: the printouts from exercises and final essays. I found that writers benefit from computers when used for freewriting rather than for structured heuristic exercises and writers tend to include a greater percentage of ideas generated in the freewriting within their final draft, because a freewriting resembles a final draft. Still, I felt I needed to see the process, to see what occurs when students use a computer for writing. This year I did a protocol study, collecting talking-aloud protocols from a freshman in College Writing I, the first of a two course sequence required of all students. In this study, I do not have hundreds of pre and post results to compare. Rather, the protocol study follows a single writer using computer tutors, programs that interactively guide the writer while she freewrites with a word processing program and generates ideas with an invention program.

Setting up the procedure. In my original study (1984),

writers used the computer only to do the heuristic exercises; they wrote the final draft longhand. I chose not to use the word processing for the final draft as it alone would boost the quality and quantity of the writing (Etchison, 1985). This time, however, I wanted to see it.

I began by teaching the entire class, 25 students in College Writing, how to use a word processing program, PC-Write 2.6, a program I had put on their disks for them. I gave them a single-page hand-out to follow and let them proceed. I chose PC-Write 2.6 because it offered on-line help with 40 topics, each screen teaching an average of a half-dozen operations. This had many advantages over my original freewriting program. Most significantly, this word processing program qualified as a computer tutor. Unlike many other word processing programs, such as Perfect Writer, a program favored at our University, it does not require that an unfamiliar user memorize commands or employ trial and error to use it efficiently.

My invention tutor was a revised version of my original computer-assisted heuristic program, QUEST, rewritten for the IBM-PC. Later in the semester, after discussing invention strategies in class, I gave the class another handout telling them how to use my invention program, having included the program on their word processing disks.

I took a closer look at one freshman, Leslie. She impressed me as independent, perhaps because she was two years older than her classmates. She asked me after class if she could learn more about writing with the computer, about word processing. I asked her if she would be willing to help with something I was doing and explained that I was interested in seeing how students

experience writing with a computer and that I would like to tape her as she worked at the computer. I explained what a talking-aloud protocol is, that she was to verbalize everything as she was thinking it or as she was reading it. I told her that I was interested in seeing her in the act of writing, hearing what she thought and did in using the computer, learning what she found difficult. I told her not to worry about sounding "stupid" because I was interested in knowing what students had trouble with so that I could better anticipate their problems and ultimately be a better teacher. She agreed to come regularly once a week, in the evening, when the department would be relatively free from distractions, the teachers and students gone to their evening classes, and the department's computer free. I was not able to find anyone else, in my class of twenty five, who was both willing and dependable enough to participate under these conditions.

During the protocol sessions I told her to say everything she was thinking, whether or not she thought it was important or relevant; this way I was able to hear her work through the entire writing process--from generating ideas to processing lower-order concerns, spelling and proper keystrokes. I recorded her day-dreaming--reading the items on the bulletin board and telling stories as she made associations with thoughts she had written on the screen. When she was familiar with the routine, she forgot about the recorder and about my listening to her tape. She revealed surprising personal things about herself: an affair she had with her boss when she was young and foolish, her feelings about her recently-widowed mother dating. Another night I found her crying because of memories triggered by a writing about her

father, who had died a year ago. Only at the end of the semester did she seem to realize how much she had revealed, saying to me after class one day, "I bet you know an awful lot of personal things about your students; they write all kinds of things in their essays and journals," an indication that she had not been monitoring her protocols.

HYPOTHESES

User-friendly fallacy. John Seely Brown and Richard R. Burton (1975), Artificial Intelligence researchers, note that when "a person communicates with a logically intelligent system, [the person] inevitably starts to assume that the system shares his world-view" and follows the interactive dialogue. I wondered how severe a problem mistaken expectations about computer tutors would be. For example, when the program asks students an explicit question about their topic--gun control, higher education, animal experimentation--do the students really expect the computer tutor to know about the topic? When students are asked questions by tutors in any other situation, a writing conference for instance, it is not unreasonable to assume the questioner understands the topic. Is it unreasonable for the student to assume that a computer tutor should also have some knowledge?

Fred Kemp (1987) calls this the "user-friendly" fallacy. His notion is that we are doing a disservice to our writers when we try to make our tutoring programs "user-friendly," giving writers the sense that the computer is something other than what it is, a machine that is impressive at low level activities--counting, following orders, capturing keystrokes--but unintelligent about the discourse it displays on its screen. The

computer is not a person and nothing is gained by the computer pretending to be a person. The classic film, 2001: A Space Odyssey, caught everyone's imagination when it featured a computer named "HAL", a computer capable of thinking and feeling as a person. "HAL" has haunted our computer software since 1970. We labor to fool our students into thinking the computer is a person--which it isn't--and that the computer understands what the student types--which it doesn't--and that the computer is more of an authority on matters than the student is--which it isn't. The user-friendly fallacy leads students to expect an intelligent tutor and delivers the electronic equivalent of a dumb blonde--cute, friendly, but ultimately unaware.

Another aspect of the user-friendly fallacy is the expectation that the tutor will assume responsibility for the topic. When I did my original study, the comment was made a number of times that the students expected the computer to help them in the sense of suggesting topics to them or giving them ideas about their topic. I explained that a heuristic exercise would help, but they were expecting a sophistication Artificial Intelligence programmers are only now investigating. I wanted to see how much expectations about computer tutors influenced their effectiveness, and I wanted to see how helpful the programs were when correctly asked.

The writing process. Looking at the protocols Leslie did before and after using my heuristic program would give me the opportunity to observe her invention strategies. I hoped to make observations about what higher and lower-order concerns she had as a writer: focus, tone and voice, organization; sentence structure, grammar, punctuation, and spelling. I hoped to

observe the activities of the writing process as described by Flower and Hayes (1981): goal setting, audience analysis, problem representation, idea generation, transcription, and global and local revision. Some of my observations are included in appendix A.

Other questions. When I began the study, I was interested in seeing if writers would have operational difficulties and/or rhetorical difficulties. I deliberately made the instruction time as brief as the handout because I was interested in seeing how little was needed to use word processing and invention programs in composition classes. I wished to know if writers were able to operate the computer tutor in a computer lab without need of a lab assistant. In addition to noting ease of use, I also wished to evaluate the rhetorical value of using the computer tutors. I had a hunch that the features of word processing would encourage writers to revise and edit. I also thought that the invention programs would be able to pose heuristic questions in a way that was not confusing. I further hoped to evaluate whether the combination of word processing and invention programs encouraged the transfer of material to successive drafts.

Also of interest was the question of how much time is needed to see an improvement. In my earlier study, I concluded that a semester is really not long enough to see beneficial changes in the drafts of a writer using invention strategies. I hoped the protocol study would allow me to see if this was a plausible explanation for the "no significant difference" findings of my study and those of others before me (Burns 1979, Schwartz 1982).

FINDINGS

User-friendly fallacy. My protocol analysis showed very little of the user-friendly fallacy. Leslie seemed to be engaged by the interactive invention program, answering questions as they were asked of her, commenting, "That's nice," when the computer complimented her by name, "Okay, Leslie. You're doing terrific." Yet she never seemed to believe that that the computer was intelligent or indicated she felt engaged with another person. At one point she does say of the computer tutor "Oh, I see how this works." She never indicated by anything she said that she expected the computer to give her a topic or to tell her what to write about. The first time she used the invention program, it asked her what she would like to be called; she answered "Honey," (she had been a waitress) and everytime the computer called her "Honey," she read the remark or question in a normal tone of voice, neither endeared nor insulted by the familiarity. The next time, however, she instructed the computer to call her "Leslie," affirming by this formality that she was addressed by a machine rather than a person.

Operational difficulties. Leslie did have trouble operating the computer the first time she used the word processing program and the first time she used the invention program. The first protocol she did is fraught with frustration. Trying to insert a comma, she says,

> "I'm messing with this computer...I want to go back. I want to take everything back one space and I don't know how to do that. It makes me so angry when I can't do this...I hate this when it happens because I cannot get this to go back right and it makes me really, really angry...What is this

little mark that I made? I made it when I pushed the <alt> button, and I hate that because now it looks like this whole line is really messed up, and I'm really mad about that. I'm just going to erase it all because it keeps doing that. The only thing I tried to do is, I tried to go back and put a comma in..." (Appendix A, Protocol #1)

and when she loses her file,

"I don't believe this. It's gone. Oh, no! I'm going to cry right now...I want to cry because this is frustrating. See; I would rather not use this computer than have this happen, because right now I'm lost. I don't believe it. I don't know. It's just amazing that it could be...stop save, push F9. I don't know. I can't believe that that's gone, if you want to know the truth." (Appendix A, Protocol #1)

Likewise, the first time she used the invention program was equally frustrating. That night she left a note on my desk with the printout she received of her answers to the heuristic probes (Appendix B, Protocol #4 Printout) saying, "Mr. Strickland, This didn't turn out very good. When I tried to start over again, it didn't work." But these operational problems disappeared by the second use (Appendix B, Protocol #5 Printout). Perhaps we might best warn our writers that computers are going to be damn frustrating the first time, but after that, they're wonderful. I wonder if they'll believe us.

Leslie never asked for help from the help screens on PC-Write, although I told her about the on-line help and noted the option on my one page handout. She used the word processing program as a glorified typewriter, missing out on the chance to revise and edit using features such as cut-and-paste or search-

and-replace. The word processing program had the capacity to tutor her in these techniques but was never given the chance. Finally at the end of the semester, I walked her through the help screens. Perhaps there is a certain amount of "hand holding" needed for every computer novice, regardless of on-line help, and a threshold to cross requiring a human teacher/tutor/lab assistant.

Leslie was more willing to ask for help when it was offered by thee invention program. She easily followed the directions to bring up the screens. When consulted, they apparently seemed to answer her questions because she was usually able to answer the probes after reading the examples. Nevertheless, at one point, she said, "Well, that example is so much easier than [my topic] rock music." (Appendix A, Protocol #4)

Rhetorical difficulties. Leslie became competent at using the invention program but had difficulty seeing the material generated as raw material for an essay. The frustrations she experienced the first time using QUEST disappeared by the next time she used it, a pattern consistent with her experience of word processing. Her use of word processing continued throughout the semester but her use of the invention program peaked quickly. She didn't want to use it later in the semester, because, she told me, the exercise seems to slow down the draft production. It results in a data file of answers to the probes and not a text file of sentences and paragraphs. She became competent at the program as a discrete entity, but did not transfer it to her writing behavior. The question returns, how do we to convince writers that spending time with heuristic exercises, writing strategies that seem to postpone the production of the essay,

will actually profit a writing?

Although Leslie herself did not see the value in spending time with the invention exercises, I still believed they were helpful. To gauge the helpfulness of the invention program, I relied on a measurement that I used in my earlier study. Basically, the scheme judges the invention exercise as helpful if the ideas it generates are actually used in the final draft. My earlier study found freewriting to be more helpful, its ideas used in a greater percentage than its competitor, the QUEST heuristic. The protocol study showed something quite different (Appendix C). Two freewritings produced a greater number of ideas for a writing than one exercise with QUEST, the freewritings producing 36 ideas in all, but over half of those ideas were never used in the final draft. Another fourth of those ideas were repeats, recurring in both freewritings. The invention heuristic produced a comparable number of ideas per session (20 versus an average of 18), and it seemed more helpful because Leslie chose to use 50 percent of the "ideas-generated" in her final draft.

At first, this study seems to confirm the conclusion that students do not see the value of using computer heuristics such as QUEST and readily abandon them in favor of a more comfortable and familiar freewriting/word processing program. However, upon further analysis, I found that this student did transfer a greater percentage of ideas to the final draft from the QUEST format than she did from freewriting alone and she wrote a better essay. I asked colleagues of mine at the University to judge the quality of the essays in a forced preference test. They chose the essay on beauty products, written after completing the

heuristic exercise, over the essay on education, written after a series of freewritings. One of the reasons they gave for their choice was that the essay on education read like a freewriting while the essay on beauty products showed a reader-based organization (Flower, 1979). Leslie herself confirmed that she felt the essay on beauty products was a better essay, although it took longer to write. Though our students may not be consciously aware of its benefit, computer heuristics are beneficial to the quality and quantity of ideas in the final draft. It is our responsibility to discover a way to get through our students' initial reluctance to use these programs so that, through long term use, their writing may benefit from these computer tutors.

Diane Langston (1986) thinks we need new paradigm applications for the new technology. What I've been looking at are what she calls old paradigm execises--pen and paper activities translated for the computer. But I have become convinced that we need to develop new paradigm tutors for a particular point in the composing process: after material has been generated and when the writer is trying to evaluate and revise. I do not think our students have enough top-level goals and corresponding strategies to evaluate what they've produced. As a result, they transfer material wholesale. It's not so much that the freewriting resembles the final draft as that the writers have no other strategy. In my protocol study, I saw no examples of global revision, only lower-order local changes. This is consistent with what Colette Daiute (1986) found with the writers she studied: most revised by adding at the end rather than by global revision. Leslie's final essays show the need for tutoring at the reshaping stage when she needs to shift from

writer-based to reader-based prose. Our computer tutors, limited by the present state of Artificial Intelligence technology, are unable to make the kinds of suggestions that human tutors can. They are unable to offer the type of "find and fix" strategies that writers need to evaluate their own work (Hayes, 1987). Computer tutors, new paradigm tutors, need to be developed to tutor at the most critical point, reshaping and evaluating material, whether that material was generated by a freewriting or an invention heuristic.

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Appendix A

PROTOCOL #1: OBSERVATIONS ABOUT LESLIE'S USE OF WORD PROCESSING

1. She loses her confidence with file management:

"Start again...Alt,Ctrl,Delete. Okay. The first problem with this computer is not being real good on how to run it. And that creates a problem right off the bat. Right now I'm thinking how much time I'm wasting because I screwed it up. And now I'm starting all over again."

2. She uses old strategy for essay writing--looking in a dictionary:

"Okay...Where do I start? Right now my mind's a blank and I have to think about what education is. I'll start with...well, education... knowing a lot about something. education is...no. If I had a dictionary I'd look up what education is, but since I don't, I won't..."

3. Her frustration inserting a comma shifts her attention from high-order idea generating to low-order production; when she returns says she's forgotten her idea:

"...let's see...I know a lot of people who are educated. However... however, they are...I know a lot of people who are...oops, I've got to back up....who are...comma...who are...comma. I'm messing with this computer...I want to go back. I want to take everything back one space and I don't know how to do that. It makes me so angry when I can't do this...I hate this when it happens because I cannot get this to go back right and it makes me really, really angry...What is this little mark that I made? I made it when I pushed the <alt> button, and I hate that because now it looks like this whole ine is really messed up, and I'm really mad about that. I'm just going to erase it all because it keeps doing that. The only thing I tried to do is, I tried to go back and put a comma in....I know a lot of people who are...comma... and then it just got messed up after that. And that's how long it took me, and I've just erased it so that I can start again.... who are...space...Now I've forgotten even what I had written."

4. A long narrative about Len, her office manager, illustrates her point about education but doesn't appear in the text generated. A human tutor might suggest including the story of Len, if the tutor knew that was what she was thinking about. The trick is how to uncover unwritten narratives:

"I know a lot of people who are educated but who have absolutely no common sense. Right now, I'm thinking of this guy, and he had a Master's Degree, he was an accountant, I think...I mean, he talked...I mean, he was really educated...I mean, I know he went to school for a really long time, and his name was Len O---. And he was really smart, but I'll tell you, he was an idiot. And I was young and I worked in the office and he was my office manager. And I didn't know whether it was me or him because he

just got on my nerves. I mean, everyday...he picked the long way to do everything; he had no common sense, and I had a really hard time working for him, because I thought he was an idiot, and he was. I mean, he was indeed. I mean, he finally got fired because he was an idiot, but he was really educated. And he would have a way to file these things, or something, and I mean, I just would file them in 5 minutes...get it over with. And it would take him 15 minutes to tell me how to file it. And I can remember saying to one of the girls in the office, it took me a long time before I would say anything, but I used to roll my eyes to myself, or you know, I used to just grit my teeth because I was young and I was new and I didn't want to cause any trouble. But after a while, I said to the girl, I said, is it me or is it Len? I mean, is he a jerk? Because he had no common sense. He was an idiot, but he was really educated. And that's one thing education is not; it does not make a person smart. I know a lot of people who are educated but have absolutely no common sense. And that's what I thought of when I thought of that person, because Len had no commonsense. And right now, sometimes, I wonder what ever happened to Len, because...I don't know...he was a weird bird, I'll tell you. I know a lot of people who are educated but have alsolutely no common sense."

5. She understands the difference between pen & paper and computer: she can't lose pen & paper.

"See, it's gone, because I didn't save that. See, now I'm totally frustrated because now everything on there is gone, and I don't have it written down on my pencil and paper because I didn't do that part. I was writing this from my head and I was getting into it, too. I don't believe this. Hold on. I'm going to push escape, and I'm going to look for F9. I want to find text...F9. No. What a drag. I don't believe this. It's gone. Oh, no. I'm going to cry right now...I want to cry because this is frustrating. See, I would rather not use this computer than have this happen, because right now I'm lost. I don't believe it. I don't know. It's just amazing that it could be...stop save, push F9. I don't know. I can't believe that that's gone, if you want to know the truth."

6. When she begins the second time, she retains a goal set earlier, rather than the last thing in memory.

"Let's first...Let's first consider what an education isn't. It seems easier to write what it's not, because I know it's not having common sense because of what we already talked about with Len. I seem to know what an education isn't."

7. She seems conscious of unstated plans:

"...let's see. If being educated was the only means of success how can we explain...how can we explain people who are not educated...educated and...educated...when I say educated I mean, like a higher education. But see, this paper isn't really explaining that because the next thing I'm going to get to is being educated through other means, other than school. "

8. She is uncomfortable composing at the terminal or with

freewriting.

"See, right now I only have about...I don't know...1,2,3,4,5,6,7,8,9,10, 11,12,13...I only have 13 lines and it's 6:30, so I think that's a drag. I mean, I don't have very much written at all, and I wasted more time. See, my attention span is almost through, and that's sad because I like writing. But this is...this is really hard because I'm just doing this from my head. I mean, it can't possibly be the best that it can be because I'm just thinking this and writing it. I'm just going along. I mean, how can this be right..."

PROTOCOL #4: OBSERVATIONS ABOUT HER FIRST TIME WITH QUEST INVENTION PROGRAM

1. She seems adventurous this week, trying things to see what happens, sampling all the menu options, asking for all the help screens.

2. She makes mistakes, just like her first week with word processing:

"How much can it change before it's no longer rock music....a...The beat must change. The beat must change. I messed that up. I hit return and I shouldn't have. Okay. Now we're going to try..."

3. She gets tired/frustrated and says, in answer to the question,

"Would you like some more randomly selected questions? No. No more of that. Oh I see how this works. Would you like to answer questions about rock music according to..."

4. She understands a help screen is just an example; it doesn't help with her topic:

"What are the component parts of rock music.? What are the parts that make it up. Oh, boy. Try for four parts. If you want help, then type the word, help. Okay. If you think of a body as a unit and I ask about the component parts, you'd write trunk, arms, head, legs. And then I ask about the face, you'd write: nose, eyes, mouth, forehead. Now I can ask about components of the eye, and if you studied your anatomy, you could give the parts of the eye.

5. She tries for a help screen where there isn't any and the system records the word, "help" she typed as her answer and continues.
(see appendix B, printout from Protocol #4)

6. She becomes over-tired and confused when trying to get printout, and once confused, it becomes more difficult for her to correct--sort of like quicksand:

"I don't know how to get out of here now. It just keeps going

pitty-pat. There...press control. Okay. I don't know what to do now. I'm going to have to do that...I push alter, control, delete...Yes. I want to see the directory. Press escape and hold. Well...I don't know what I'm doing now. I just want to get back to something. I want to look at the essay...control alter,delete. I'm going to start over again...Let me see...This is it, right? I don't know what to do with you...I'm waiting. I don't know what I'm doing. I just want to get out of here. I'm just waiting now. Let's see..Abort. I don't know what we're doing now...I don't know what to do. I just want to find my directory. Help...That's all right. First name for directory. e-d-t-x-t...Oh, here we go...I don't know...I think this is time to get out of here...hit escape...."

PROTOCOL #5: OBSERVATIONS ABOUT HER SECOND TIME WITH QUEST

1. She generally re-reads invention questions but doesn't re-read other directions on screen. Perhaps she re-read for a different type of processing:

"Let's select a level to work on. If this is your first time, why not begin with level one; otherwise try more questions or more difficult ones. Try levels 2,3,4 for increasing difficulty and level 5 to see your list of answers when you are done. Level 1...return. Now we will treat it as a system with parts. What are the component parts of beauty products. What are the parts that make it up? if you have already...okay. Okay. What are the component parts of beauty products? What are the parts that make it up?"

2. She reads an invention question twice and realizes her topic, as stated, doesn't fit the question; so she changes the topic:

"Okay, now let's consider our topic beauty products as a unit. What features distinguish it from other things that are similar to it? Okay...you know what? I want to change this and make it like Mary Kay. What features distinguish it from other things that are similar to it?"

3. She asks for a help screen partly out of curiosity:

"If you want help, just type the word. Okay, try for...okay,let's push help and see what happens."

4. Her reaction to a "user friendly" comment:

"Okay, Leslie. You're doing terrific. That's nice."

5. She develops her own heuristic to generate an answer to the explicit question, what are its features? She projects herself into a situation where she has to verbalize the implied question, what else do they do?

"What do I say when I sell Mary Kay?"

6. When she gets stuck for a fourth answer, she reviews what the other answers are to get an idea; this leads to a general idea:

"Beauty products a...beauty products can do what nature left out. I know. They hide...whoa! They hide imperfections...hide imperfections."

7. Her elation, having generated four answers, is immediately crushed because she hasn't entered the information the way the program expected it and has to shift attention to getting around in the program, going back and entering it the way the program wanted:

"Now I can return; I did all 4. [reads] Feature #2. Oh wow! I messed this up, I think. Okay, now I've got to think of something else they do. I think I really messed this up. I don't know how to...I don't know how to go back. I know, you told me to go up. Oh, I see how they do it. Okay, I'm going to change this since I...because I left this out. Okay I'm going to go back and do this...Like feature #1, cleanse the body...beauty products...what features distinguish it from other things that are similar to it? Okay...Now where am I?"

PROTOCOL #9: OBSERVATIONS ABOUT FINAL WORD PROCESSING WITH HER PRINTOUT FROM QUEST EXERCISE

1. She starts with what seems a top-level sentence, but it isn't developed in the essay. It's a basic writer's version of the topic sentence, a general opener:

"Everybody uses beauty products."

2. She works in a noun phrase, which one of my raters picked up as a syntactic maturity marker:

"an outer appearance," explicitly stating the comma.

3. She shows a consciousness of print conventions:

"...maybe I'd better put 'dirty' in quotations."

4. She does local revision, at the level of word choice:

"people..instead of people...our society.";"...bring out their good qualities...not good...their naturally attracting qualities."

5. She is conscious of overuse of slang expressions:

"...amazing..oh, I hate the word, 'amazing'."

6. She is aware of her spelling difficulties when they appear in electronic print (didn't show in the handwritten essay protocol).

7. She makes a planning statement that is included in the essay.

"I would like to take a closer look ";"I would like to focus on the effects..."

8. She shows a continued consciousness of planning:

"I don't want to put about the income yet..."

9. At the end of the protocol she finally discovers her issue:

"See, what I'm trying to get to is beauty products...how they change a person...I know this sounds weird, but I understand how they change a person externally, but how it affects them internally. That's the major thing of this."

Appendix B

Printout from QUEST following Protocol #4

"11-4-86" "Honey",

ROCK MUSIC

THERE IS DISCONTENT IN YOUNG PEOPLE.

EVERYONE IS LOOKING FOR SOMETHING DIFFERENT.

THERE IS ALOT OF COMPETITION AND MUSICAL ADVANCEMENT LEADS WAY TO AN EVEN HARDER TYPE OF ROCK

HELP

LOUD , IT IS RADICAL , CONTRASTED TO EASY LISTENING. EXAMPLE CLASSICAL MUSIC, IT IS HARD TO UNDERSTAND SOMETIMES.

Printout from QUEST following Protocol #5

"11-11-86" "LESLIE"

BEAUTY PRODUCTS

SCIENTIFICALLY SPEAKING BEAUTY PRODUCTS WEREN'T AS GOOD AS THEY ARE TODAY.

IN THE PAST RESEARCH WASN'T AS ADVANCED. LIFESTYLES AND EATING HABITS HAS MAKE SKIN PROBLEMS AND AGING MORE OF A CONCERN NOW THEN IT DID YEARS AGO

MORE COMPETIVE SINCE THE MEDIA IS PUSHING EVERYONE TO BELIEVE THAT LOOKING YOUNGER IS THE KEY TO A HAPPY LIFE. EVERYWHERE YOU LOOK PEOPLE ARE LOOKING FOR THE MAGIC FORMULA.

THE PUBLIC CRIES FOR AN ANSWER TO THEIR BEAUTY NEED. BEFORE THEY ARE MARKETED THEY MUST BE TESTED AND PROVED SAFE.

THEIR IS USUALLY A STORY BEHIND HOW A FORMULA WAS DISCOVED AND PROVED SUCCESSFUL.

HAIR PRODUCTS ARE A NECESSITY FOR GENERAL HAIR CLEANSING. BEAUTY PRODUCTS REDUCE DISEASES CAUSED BY UNCLEANSINESS. CLEANSES THE BODY

BEAUTY PRODUCTS MAKE A PERSON FEEL BETTER. THEY ULTIMATELY MAKE THEM ACT BETTER BECAUSE THEY FEEL BETTER. THEY PROTECT AND KEEP THE SKIN FROM AGING. BEAUTY PRODUCTS CAN, DO, HIDE IMPERFECTIONS. THEY CAN DO WHAT NATURE DIDN'T. IF USED THE RIGHT WAY BEAUTY PRODUCTS CAN ENHANCE A PERSONS NATURAL BEAUTY.

BEAUTY PRODUCTS CAN MAKE A PERSON FEEL BETTER ABOUT THEMSELVES.

IF A PERSON IS SAD IF THEY CLEAN THEMSELVES UP A PUT ON SOME MAKEUP 9 TIMES OUT OF TEN THEY WILL PROTRAY AN ATTITUDE OF SELF CONFIDENCE.

(WOMEN IN GENERAL),KEEPS THE SKIN FROM DRYING OUT AND SHOWING SIGNS OF AGING. DEPENDING ON A PERSONS SKIN TYPE THEY CAN USE PRODUCTS THAT ARE DESIGNED TO REDUCE THE NATURALAGING PROCESS. YOUR SKIN IS LIKE ANYTHING ELSE IT WEARS OUT IN A MATTER OF TIME

SKIN CARE,BODY CARE,HAIR CARE,GLAMOUR

BEAUTY PRODUCTS GENERATE A LOT OF INCOME BEAUTY PRODUCTS COME IN MANY FORMS AND MANY PRICES. IT WORKS ON SUPPLY AND DEMAND

EVERYONE USES BEAUTY PRODUCTS TO A CERTAIN DEGREE BEAUTY PRODUCTS CAN NOT BE KEPT. THEY ARE USED UP SO AS FAR AS MONEY GOES, TO SOME PEOPLE THEY AREN'T A GOOD INVESTMENT.

THEY INITIATE SELF WORTH. THEY CLASSIFY PEOPLE. BEAUTY PRODUCTS ARE SEEN WITH THE HUMAN EYE IMMEDIATELY UPON MEETING OR PASSING BY SOMEONE.

Appendix C

IDEAS AS GENERATED IN INVENTION PROCESS;
THEIR USE IN FINAL DRAFT NOTED IN BRACKETS.

Freewriting on Education : The "lost" file

1. Education is an ongoing process. ["Education is an ongoing process, it doesn't have a beginning or an end."]

2. You can never reach a point where you are throughly educated. [does not appear]

3.Living is learning and learning is what education is all about. [does not appear]

4. Learning about life and getting along with others could certainly merit being educated. [does not appear]

5. You can never be too smart, or you can never be too good. [does not appear]

6. I know a lot of people who are educated but who have absolutely no common sense. ["He doesn't use simple common sense because he neglected the other areas of balance and has an over supply of education."]

7. Education does not bring a person everything they want. ["This person may find that his education did [not] fulfill everything on his lists of goals."]

The second file

8. topic; thought about what education is. ["Topic : What I think an education is."]

9. Let's first consider what an education isn't. [does not appear]

10. Being educated doesn't make a person smart. [does not appear]

11. I've known alot of people who were educated throught higher education means that had absolutely no common sense. [repeats #6]

12. Education is not the means by which you get everything that is on your want list. [repeats #7]

13. Young people think that if they go to college they will eventually get a good job and make alot of money, ["He thought that through getting an education he could obtain money, and fame."]

14. what a dissapointment to invest all their time and money and find out in four years that they can't get a good job and they don't have any money and worse yet they aren't even smart. ["What a sad day for a

person to realize that the only thing an education got him was a certificate and specialized knowledge, however he now has to apply this specialized knowledge and this becomes a problem."]

15. An education is not a guarantee. [does not appear]

16. There are no guarantees in life. [does not appear]

17. If being educated was the only means of success how can we explain people who are not educated and are very successful. [does not appear]

2nd Freewriting - Education

18. Education is the key to our future, the explanation of our past, and our present eveolves around this. [does not appear]

19. When I sat down to write about this I ask myself where would we be without Education. [does not appear]

20. Can you even begin to imagine? [does not appear]

21. I realize not everyone feels the same about education. [does not appear]

22. Every indivual has their own unique list of goals, values, and expectations. [does not appear]

23. I believe these things are within us at a very young age. [does not appear]

24. There are many factors that I contribute to this but that's a whole different topic. [does not appear]

26. Let's first evaluate what education isn't. [repeats #9]

27. That will narrow the choices of what it is. [does not appear]

28. Many young people think that if they get a good education then they can obtain everything on their want list. [repeats #12]

29. They graduate from high school and go to college in pursuit of a promising career, one in which I hope they chose themselves. [repeats #13]

30. They expect to be educated in four years and that's all there is to it. [does not appear]

31. Is that what an education is? [does not appear]

32. Many people are dissapointed when they can't find a job, but they are educated. [repeats #14]

33. So being educated doesn't promise you a job or an income. [repeats #15: An education is not a guarantee.]

34. An education doesn't make a person smart. [repeats #10: Being educated doesn't make a person smart.]

35. I'm sure you can think of at least one person who has had a great deal of education but who doesn't strike you as being the least bit smart. ["The person who is possessed with gaining knowledge that he becomes an educated fool. He has gained knowledge but somehow missed out on how to apply the knowledge."]

36. I know a person who has absolutely no common sense but is educated. [repeats #6]

QUEST exercise on "BEAUTY PRODUCTS"

1. SCIENTIFICALLY SPEAKING BEAUTY PRODUCTS WEREN'T AS GOOD AS THEY ARE TODAY. [does not appear]

2. IN THE PAST RESEARCH WASN'T AS ADVANCED. LIFESTYLES AND EATING HABITS HAS MAKE SKIN PROBLEMS AND AGING MORE OF A CONCERN NOW THEN IT DID YEARS AGO [does not appear]

3. MORE COMPETITIVE SINCE THE MEDIA IS PUSHING EVERYONE TO BELIEVE THAT LOOKING YOUNGER IS THE KEY TO A HAPPY LIFE. EVERYWHERE YOU LOOK PEOPLE ARE LOOKING FOR THE MAGIC FORMULA. [does not appear]

4. THE PUBLIC CRIES FOR AN ANSWER TO THEIR BEAUTY NEED, BEFORE THEY ARE MARKETED THEY MUST BE TESTED AND PROVED SAFE. [does not appear]

5. THERE IS USUALLY A STORY BEHIND HOW A FORMULA WAS DISCOVERED AND PROVED SUCCESSFUL [does not appear]

6. HAIR PRODUCTS ARE A NECESSITY FOR GENERAL HAIR CLEANSING. [does not appear]

7. BEAUTY PRODUCTS REDUCE DISEASES CAUSED BY UNCLEANSINESS, CLEANSES THE BODY. ["The effects range from cleaniness, an outer appearance... How many people ever stop to think that with the aid of beauty products that first impression could change a "dirty" old man into a "clean" sweet elderly man...beauty products aid in overall body cleaniness."]

8. BEAUTY PRODUCTS MAKE A PERSON FEEL BETTER. THEY ULTIMATELY MAKE THEM ACT BETTER BECAUSE THEY FEEL BETTER. ["I have actually witnessed beauty products turning a sour faced women into a radiant self-fulfilled woman....she feels good about the decisions that she has made."]

9. THEY PROTECT AND KEEP THE SKIN FROM AGING. ["She has taken a giant step to preserving her skin..."]

10. BEAUTY PRODUCTS CAN, DO, HIDE IMPERFECTIONS. THEY CAN DO WHAT NATURE DIDN'T. IF USED THE RIGHT WAY BEAUTY PRODUCTS CAN ENHANCE A PERSONS NATURAL BEAUTY. ["Beauty products can not take away from a person's beauty they can only add to their beauty....We use products to hide and conceal flaws while we bring out their naturally attracting qualities."]

11. BEAUTY PRODUCTS CAN MAKE A PERSON FEEL BETTER ABOUT THEMSELVES. IF A PERSON IS SAD IF THEY CLEAN THEMSELVES UP AND PUT ON SOME MAKEUP 9 TIMES OUT OF TEN THEY WILL PORTRAY AN ATTITUDE OF SELF CONFIDENCE. ["Immediately the transformation on the outside starts to penetrate inward as this woman begins to see herself in a different light. Her inferiority complex subsides while she is actually seeing an improvement."]

12. (WOMEN IN GENERAL),KEEPS THE SKIN FROM DRYING OUT AND SHOWING SIGNS OF AGING. [does not appear]

13. DEPENDING ON A PERSONS SKIN TYPE THEY CAN USE PRODUCTS THAT ARE DESIGNED TO REDUCE THE NATURAL AGING PROCESS. YOUR SKIN IS LIKE ANYTHING ELSE IT WEARS OUT IN A MATTER OF TIME. [does not appear]

14. SKIN CARE , BODY CARE , HAIR CARE , GLAMOUR ["...any product including hair care, skin care, and makeup...Our society pushes products, fashion, and glamour on women..."]

15. BEAUTY PRODUCTS GENERATE A LOT OF INCOME [does not appear]

16. BEAUTY PRODUCTS COME IN MANY FORMS AND MANY PRICES. IT WORKS ON SUPPLY AND DEMAND. [does not appear]

17. EVERYONE USES BEAUTY PRODUCTS TO A CERTAIN DEGREE. ["Beauty products are used [by] everybody."]

18. BEAUTY PRODUCTS CAN NOT BE KEPT. THEY ARE USED UP. SO AS FAR AS MONEY GOES, TO SOME PEOPLE THEY AREN'T A GOOD INVESTMENT. ["Her investment can not be made using dollars and cents"]

19. THEY INITIATE SELF WORTH. ["this woman begins to see herself in a different light. Her investment can not be made using dollars and cents, because dollars do not measure self fulfillment."]

20. THEY CLASSIFY PEOPLE. BEAUTY PRODUCTS ARE SEEN WITH THE HUMAN EYE IMMEDIATELY UPON MEETING OR PASSING BY SOMEONE. ["We live in a society where cleaniness is a factor that classifies people by their appearance."]